WNMA Project

Real-time crowd information using Bluetooth: a full-stack solution

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25 Marzo 2025

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Outline

Project Idea: is it possible to exploit Bluetooth to count how many people are there in a room / building and the occupancy trends?

- Seat availability in libraries (without reservation)

- Workforce management (effective deployment)

- Health-critical monitoring (pandemic)

Assumption: BT is a very diffused technology and nowadays most people have a BT-enabled device (smartphone, smartwatch, etc.) with them. Often it is turned on beacause of low energy consumption.

The scanner is a device that periodically scans [1] the environment for Bluetooth devices and sends the data to the server.
Implemented in Go, can run both on Raspberry Pi and Arduino[2].

Features

- Low energy consumption
- Low cost hardware
- Easy deployment

Thanks to linux's crontab, the scanner can be scheduled to run at specific times, e.g. every 5 minutes.

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[1] Use the go-bluetooth library and the Bluez DBus API
[2] Can be compiled for Arduino using TinyGo

Server

The server includes both a backend and a frontend developed in a product-ready fashion.

Backend

- Implemented in Go
- RESTful API
- Data storage: SQLite
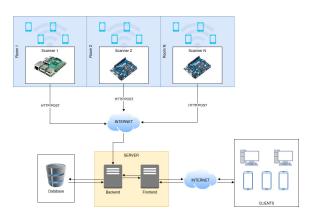
Frontend

- Implemented in React
- Real-time data visualization

Figure: System architecture

The system has been tested in a real environment: a small local library.

- The scanner (Raspberry Pi) has been placed in a central position
- To avoid hosting costs, the server has been deployed on the Raspberry loopback interface
- Three days of data collection with few people in the library

Field test